A NOAA Weather Radio Primer: Your Wireless Gateway to Nature's Excitement

By Joseph Pasquini, N2NOU

One of the best uses of our federal taxpayer dollars — and of interest to communications hobbyists and the general public alike — is NOAA Weather Radio (NWR).

More and more general coverage radios and scanners produced today are capable of receiving at least the audio transmissions from its VHF-based informational and early warning radio service, **Photo A**.

With advances in technology, the format and the scope of this National Weather Service (NWS) offering has evolved and matured over the years in order to better serve its listening audience. Thanks to such improvements as enhanced RADAR imaging and analysis <http://bit.ly/Oqi9nB>, the leveraging of SKYWARN® spotters <http://skywarn.org>, and the implementation of computer synthesized broadcasters, NWS forecasters are more prepared than ever to deliver potentially life-saving information in a more timely and efficient manner.

"NWS forecasters are more prepared than ever to deliver potentially life-saving information in a more timely and efficient manner — via NWR."

What is NOAA Weather Radio?

Best defined by the National Oceanic and Atmospheric Administration itself, NWR is an all-hazards public warning system that broadcasts forecasts, warnings, and emergency information 24 hours a day directly to the general public. Weather messages are repeated every 4 to 6 minutes and are routinely updated every 1 to 6 hours unless rapidly changing events warrant more frequent updates.

Photo A. There are many radios today that have the capability to receive NOAA Weather Radio broadcasts, as well as receivers solely dedicated to NWR frequencies, such as this Midland WR-100 SAME Digital Weather/All Hazards Alert Radio. *(Internet screen grab <http://bit.ly/UAn06W>)*

Recognized as the "Voice of NOAA's National Weather Service," NWR is comprised of a nationwide network of radio stations broadcasting continuous weather information and is offered by NOAA as a free public service. Each National Weather Service office is assigned an area of responsibility, and local NWR stations broadcast warnings, watches, special statements, forecasts, and other hazard-related information 24 hours a day throughout its coverage area. *(**SEE:** A comprehensive map of NOAA Weather Radio Stations at <http://1.usa.gov/Wrwxh2>. Click on states to get a view of specific area coverages, **Photo B**. **LISTEN:** To live streaming audio of NWR broadcasts at <http://bit.ly/T5ISYm>. – JP.)*

Today, NWR includes more than 1,000 transmitters covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories.

In the 1950s, the old Weather Bureau — the precursor of the modern National Weather Service — began broadcasting aviation weather across two stations. During the 1960s, stations were added for marine users. By the late 1970s, the system spanned more than 300 stations and increased to more than 600 transmitters by 2001, **Photos C** and **D**.

Choosing a Radio for NOAA Weather Broadcasts

There are lots of receivers with NWR capability on the market today. The National Weather Service has tips on how to choose a receiver that will meet your needs. In addition to giving an overview of possible features, NOAA also provides a comprehensive list of radio manufacturers that produce weather radios. *(**IN DEPTH:** For more details on receivers, visit the*

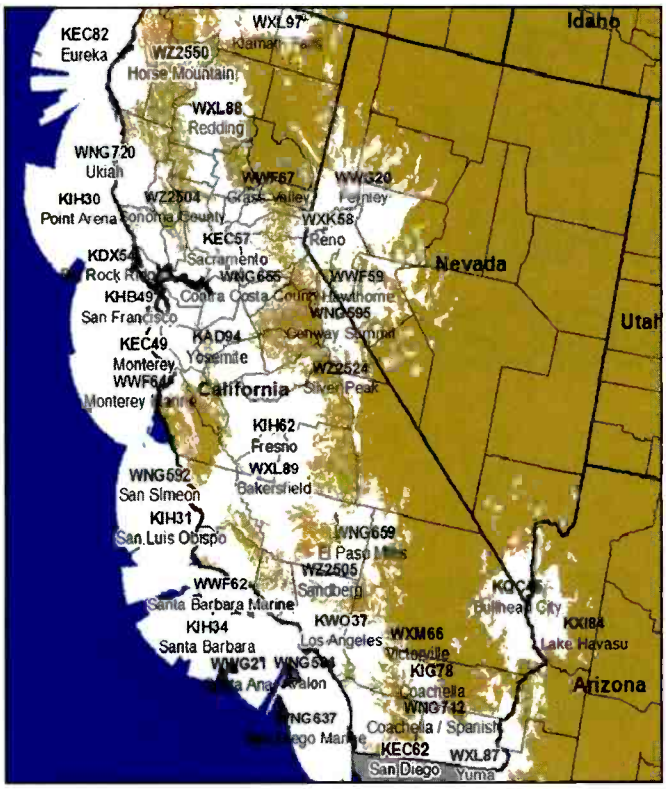

Photo B. A U.S. map of NOAA Weather Radio stations can be found at *<http://1.usa.gov/Wrwxh2>*. NWR stations are shown by clicking on each state — in this case, California. *(Courtesy of NOAA)*

NOAAs site at <http://1.usa.gov/11awxFS>. Scroll down the page for links to weather radio manufacturers. – JP.)

NWR broadcasts are a great way to get young people interested in hobbyist communications, weather technology, and a whole range of scientifically-oriented subjects, **Photo E**. Weather radios are relatively inexpensive and are a gateway to a wireless world of wonderment for a young person.

NWR Frequencies

There are seven frequencies used throughout the NWR network: 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, and 162.550 MHz. Each station is licensed to broadcast on one of these frequencies.

By design, NWR stations have a typical range of 40 miles, but coverage varies by terrain and conditions. Depending upon your location, you may be able to monitor more than one station. In order to receive the most pertinent information, you should try to listen to the NWR station that specifically serves your area.

Sounding the Alarm

During an emergency, NWS forecasters interrupt routine NOAA Weather Radio broadcasts and send a special tone intended to trigger capable local weather radio receivers.

*(**WATCH and LISTEN:** To a NOAA Weather Radio severe thunderstorm warning broadcast in central Michigan. <http://bit.ly/X4LH8g>, **Photo F**. – JP.)*

When the 1050-Hz tone is received by the weather radio, the receiver is activated so that the broadcast can be instantly heard by the listener. Though this method was functional and undoubtedly saved many lives, it also became a nuisance to some lis-

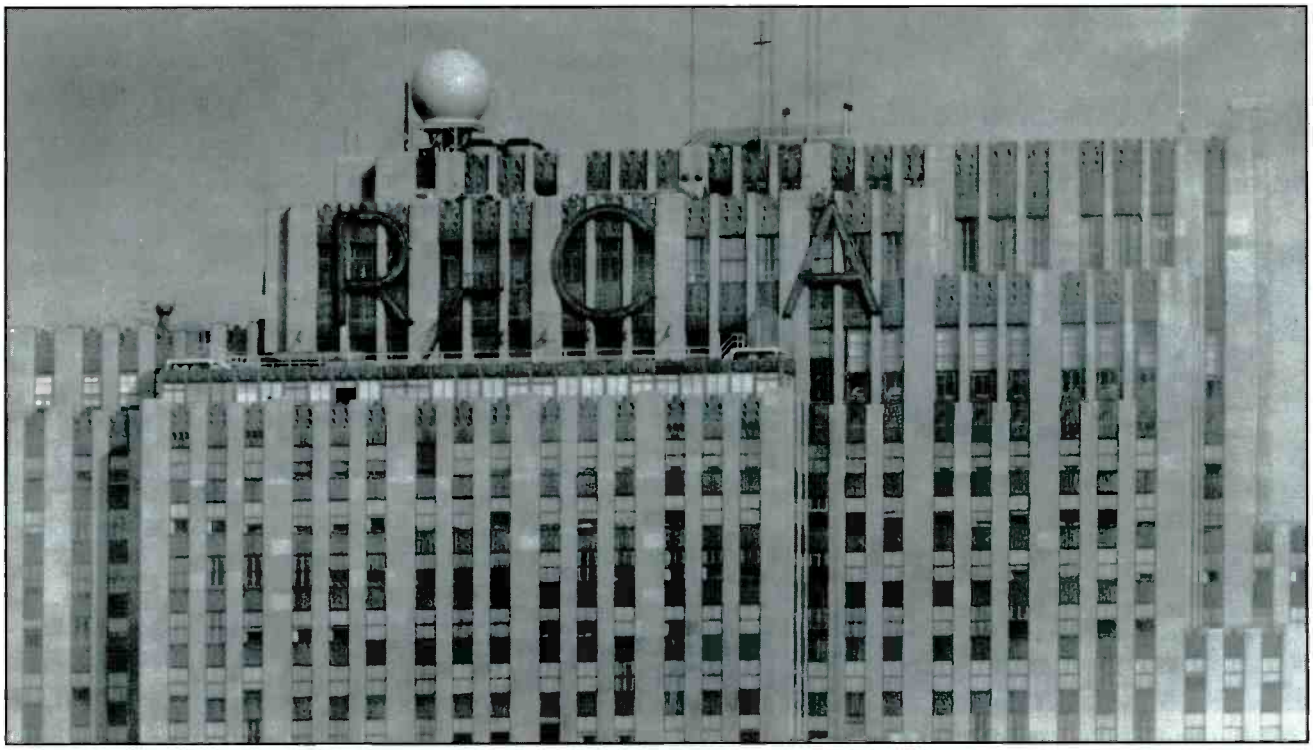

Photo C. National Weather Service offices have a long and distinguished history. There was an NWS office in midtown Manhattan on the mezzanine level of the RCA-GE building until October 25, 1993, before its relocation. The ball-shaped object on top of the building housed the RADAR unit. NOAA Weather Radio antennas are also pictured and still reside atop 30 Rock. *(Courtesy of Wikimedia Commons)*

teners due to the radio being activated for events often many counties away from the listener.

As a result, early-model radios were often turned off by their owners in exchange for a good night's sleep. While the alerts had their benefits, it was clear that a mechanism designed to target alerts toward a specific audience needed to be developed if the broadcasts were to be most effective.

Now, it's All the SAME

In 1994, NOAA began broadcasting coded signals using its SAME (Specific Area Messaging Encoding) protocol. The SAME format contains coding which represents the type of message as well as the county or counties affected.

Rather than turning off their radios in order to ignore alerts for distant areas during the middle of the night, NWR listeners could instead leave their SAME-capable receivers turned on all of the time, content in the knowledge that their weather radio would only awaken them if an alert was issued for the county or counties in which they were interested in monitoring. As a result, overall broadcast effectiveness was increased.

Each digitally-encoded SAME alert contains information about the type of alert, as well as the specific geographic locations affected by the alert along with the expiration time of the message. The SAME burst is then followed by a 10-second broadcast of the standard 1050-Hz warning alarm tone. Once the tone is sent, an audio feed composed of additional information is then received.

While many VHF receivers and transceivers are capable of picking up the audio portion of NWR broadcasts, a NOAA weather radio receiver or scanner is required to monitor alert broadcasts.

An appropriately programmed NWR SAME receiver will then turn on for that message, with the listener hearing the 1050-Hz warning alarm tone as an attention signal, followed by the broadcast message.

Depending on the characteristics of the receiver, the digitally encoded SAME transmissions may be heard as a very brief static burst by the listener. At the end of the message, listeners may hear another brief static burst that indicates an end-of-message. Following the broadcast, the NWR station may either resume its normal programming or preempt it with special statements regarding the situation if it is ongoing.

The geographic locations are designated using Federal Information Processing System (FIPS) codes. Each county or similar political division in the US and its territories are assigned a FIPS code.

In addition, certain special regions and wildcard settings can be assigned. In order to program a SAME capable receiver, you need to know the six-digit code for the county or counties whose alerts you want to monitor <http://1.usa.gov/TRD1r8>. Once you have that information, program your NWR SAME receiver following the directions supplied by the manufacturer.

Narrowing Focus: Finding Your FIPS Code

FIPS codes are available from NOAA's website <http://1.usa.gov/WvehDA> or by telephone at (888) NWR-SAME ((888) 697-7263).

FIPS codes are in the format SSCCC, where:

- *SS:* The state code
- *CCC:* The county code

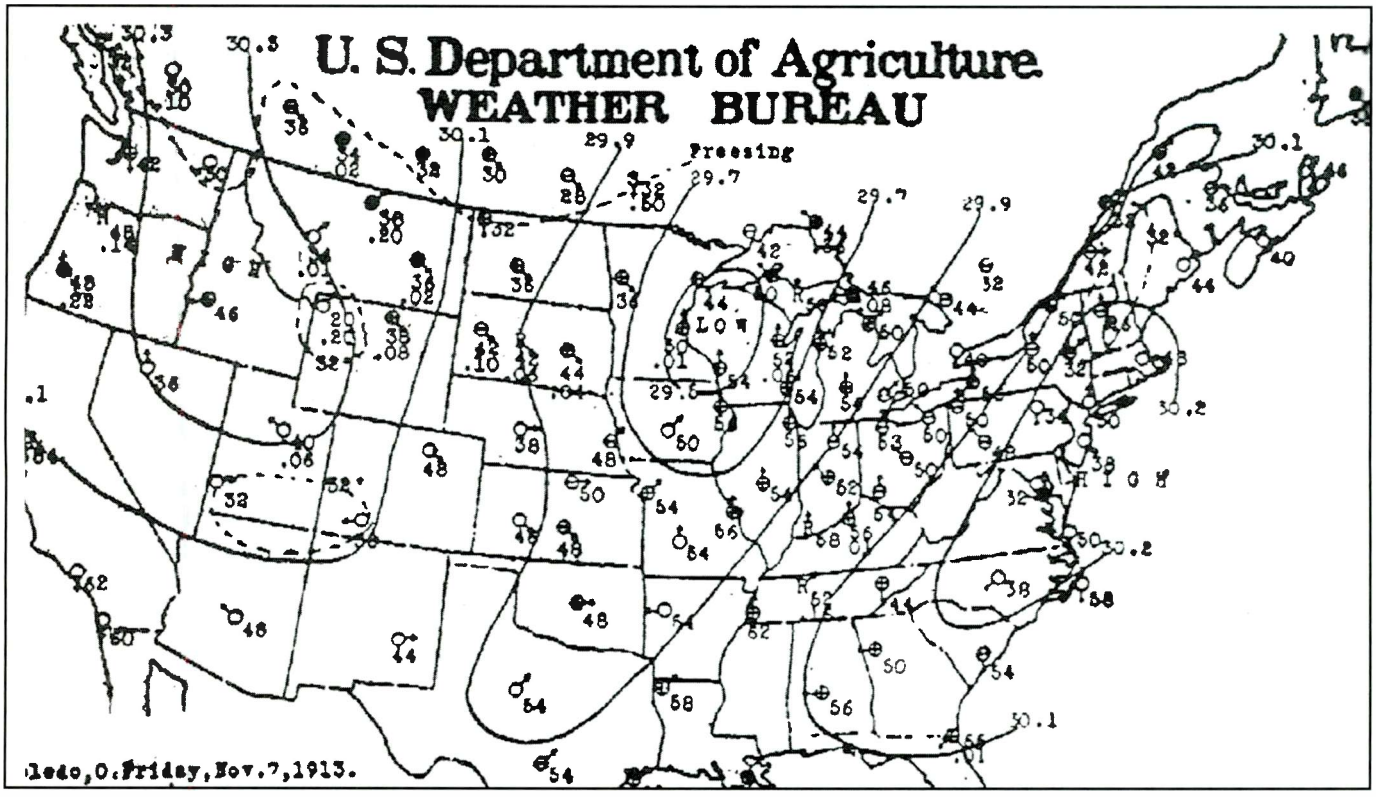

Photo D. Weather forecasting and communications have come a long way since this Weather Bureau map was made, showing weather conditions for Friday, November 7, 1913. *(Courtesy of Wikimedia Commons)*

For example, Schoharie County in New York is assigned a FIPS code of 36095.

- 36 indicates the state of New York
- 095 indicates Schoharie County

County codes are typically assigned in alphabetical order starting with 001 and incrementing by a count of two. As a result, a buffer zone is created between each code designation allowing for future growth caused by county or sub-county designation changes.

Event Filtering

In addition to the FIPS information, SAME transmissions include information detailing the type of event, **Photo G**. In May of 2002, the FCC amended the EAS rules in order to allow for additional alert types. The NWS added numerous new civil emergency, weather and natural disaster event code types in 2004 as a result of the changes in rulemaking, **Figure 1**.

While many NOAA weather radios and some scanners and communication receivers offer SAME decoding using the county FIPS codes, a few high-end NOAA weather receivers also feature the ability to filter received messages by both the FIPS regional code and the event type.

Not All Broadcasts Are Weather Related

The National Weather Service is considered the primary communications medium for the Federal Communication Commission's (FCC) Emergency Alert System (EAS) and Homeland Security's National Response Plan.

The purpose of the EAS is to broadcast official emergency information to the general public within a specific region; the National Response Plan establishes a comprehensive "All-Hazards" approach designed to enhance the ability of the United States to manage domestic incidents. In keeping with this all-hazards mantra, NWR is capable of disseminating information regarding a litany of hazards well beyond those that are weather related. The types of scenarios that may trigger such a broadcast include:

- Natural (severe weather, floods, earthquakes, volcanic activity, forest fires)

NWR: A Menu of What You Might Hear

Warnings, watches, and statements that may activate the NWR SAME system include, but are not limited to:

Weather-Related Events

Blizzard Warning	Coastal Flood Watch	Coastal Flood Warning
Dust Storm Warning	Flash Flood Watch	Flash Flood Warning
Flash Flood Statement	Flood Watch	Flood Warning
Flood Statement	High Wind Watch	High Wind Warning
Hurricane Watch	Hurricane Warning	Hurricane Statement
Severe Thunderstorm Watch	Severe Thunderstorm Warning	Severe Weather Statement
Special Marine Warning	Special Marine Statement	Tornado Watch
Tornado Warning	Tropical Storm Watch	Tropical Storm Warning
Tsunami Watch	Tsunami Warning	Winter Storm Watch
Winter Storm Warning		

Up to the Minute . . .

For Weather Event Updates, visit: <http://1.usa.gov/Wvi0kz>

Non Weather-Related Events

Avalanche Watch	Avalanche Warning	Child Abduction Emergency
Civil Danger Warning	Civil Emergency Message	Earthquake Warning
Evacuation Immediate	Fire Warning	Hazardous Materials Warning
Law Enforcement Warning	Local Area Emergency	911 Telephone Outage Emergency
Nuclear Power Plant Warning	Radiological Hazard Warning	Shelter in Place Warning
Volcano Warning		

Administrative Transmissions

Administrative Message	Practice/Demo Warning	Required Monthly Test
Required Weekly Test		

Source: NOAA Weather Radio

Figure 1.

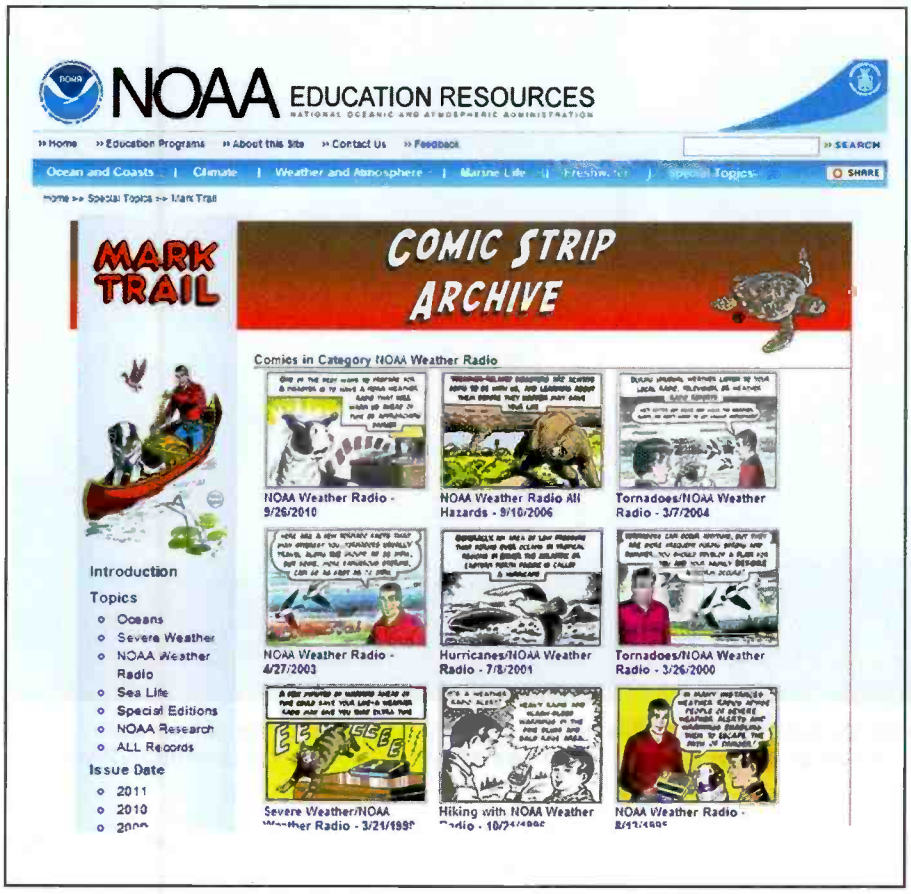

Photo E. NWR is a natural gateway for getting young people interested in meteorology and radio communications. Artist Jack Elrod has included NOAA Weather Radio in his *Mark Trail* newspaper cartoon plot lines for many years <http://1.usa.gov/WtIFhQ>. *(Internet screen grab)*

NOAA Weather Radio - EAS #242 - Severe Thunderstorm Warning - 7/25/12

Photo F. This YouTube video of an NWR Severe Thunderstorm Alert gives a sense of the excitement when things are getting whipped up meteorologically — and NOAA wants everyone in the area to know about it <http://bit.ly/X4LH8g>. *(Internet screen grab)*

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Photo G. Not many parts of the nation experience dust storms, but this *haboob* certainly made a nuisance of itself as it blanketed Phoenix, Arizona in August 2003. No doubt, NOAA Weather Radio was *all over it. (Courtesy of JuneBug172 via Wikimedia Commons)*

SPURIOUS SIGNALS By Jason Togyer KB3CNM
popcommcomic.blogspot.com

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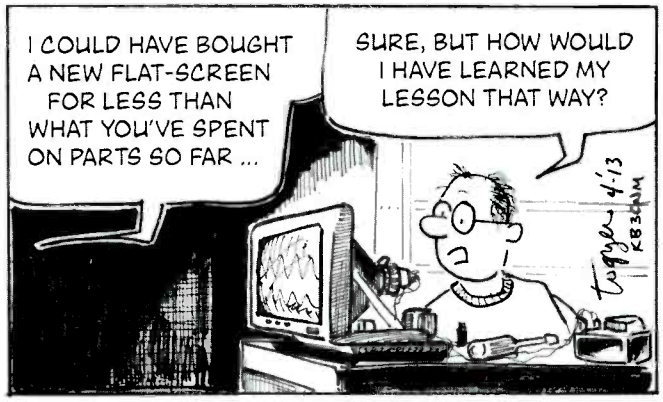
I COULD HAVE BOUGHT A NEW FLAT-SCREEN FOR LESS THAN WHAT YOU'VE SPENT ON PARTS SO FAR ...
SURE, BUT HOW WOULD I HAVE LEARNED MY LESSON THAT WAY?
togyer 4-13 KB3CNM

- Environmental, whether accidental or intentional (chemical spills, nuclear incidents, and so on)
- Law enforcement and other local emergency support activities (Amber alerts <http://www.amberalert.gov>, bridge collapses, terrorist attacks)

According to the NWS, the radio network may be used to disseminate non-weather related emergency messages when the information originates from an official government source, time is of the essence, and the public safety is at risk.

When governmental officials want to broadcast a non-weather message on NWR, the officials provide text information about the hazard along with any other associated instructions directly to the local NWS offices. In order to facilitate the process, NWS offices typically have pre-arranged agreements in place with the various governmental entities. Such agreements will vary from region to region.

All in All . . .

For the average listener, monitoring NOAA Weather Radio on a quiet, uneventful day may not be very exciting. But, when severe weather or other emergencies strike, not only is the information interesting — it more importantly has the potential to save both lives and property. For radio enthusiasts, however, NWR offers more than weather and other hazard information. It offers an often interesting and exciting source to monitor during turbulent events. And, even if you don't take advantage of the radio services offered by the National Weather Service, monitoring more distant NWR stations makes an excellent means of determining VHF propagation.

Joe Pasquini, N2NOU, is an avid amateur radio operator as well as shortwave and scanner listener with a career spanning more than 15 years in the fields of Information Security and Systems Management.